

Idaho National Engineering and Environmental Laboratory

FIELD TESTING OF ROBOTICS TECHNOLOGY FOR IMPROVING COAL MINING PRODUCTIVITY

The opportunities for automation of underground mining activities are numerous. Underground mines are dark, dirty, and cramped. Airborne dust is generated when coal is cut. It is very difficult for operators to see well enough to precisely and smoothly control the machines. The problem is further complicated by the need to keep operators an appropriate distance from the coal face. As a result, productivity suffers. It is estimated that even a 1% improvement in productivity would result in thousands of dollars of additional revenue per machine per day of operation. Robotics technology offers the promise of improving productivity. Sensors mounted on the mining equipment can accurately measure the machine's position, orientation, motion, and the amount of coal residing in the vein and the direction the vein being mined is traveling. The operator, stationed at a safe distance, can use information to precisely control the machine. Furthermore, the information can be fed into a control system to permit semi-autonomous operation. Industry and academic partners have developed prototype sensors for use in

underground coal mines, but testing has been limited. The INEEL has developed sensors which detect phosphate veins. In this program, various industry and academic partners and the Idaho National Engineering and Environmental Laboratory (INEEL) will conduct field tests and tune these prototype sensors on a production mining machine operating underground. Next, the INEEL will test existing sensors for tracking coal veins. We propose to assess, quantify, and optimize the performance gains of the technology.

Objectives: The objective of this program is to perform extensive field trials to evaluate the effectiveness of the devices in actual coal mines. To do this, we will develop a data logger to record the amount of coal mined during a given period of time. We will assess how the sensors are used, and make a recommendation on methods to improve the man-machine interface to enhance the ease of use.

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